Resumen de la conferencia de Javier Rodriguez-Rodriguez

The Physics of Beer Tapping

The popular bar prank known in colloquial English as beer tapping consists in hitting the top of a beer bottle with a solid object, usually another bottle, to trigger the foaming over of the former within a few seconds. Despite the trick being known for a long time, to the best of our knowledge, the phenomenon still lacked scientific explanation. Although it seems natural to think that shock-induced cavitation enhances the diffusion of CO2 from the supersaturated bulk liquid into the bubbles by breaking them up, the subtle mechanism by which this happens remains unknown. Here, we show that the overall foaming-over process can be divided into three stages where different physical phenomena take place in different time scales: namely, the bubble-collapse (or cavitation) stage, the diffusion-driven stage, and the buoyancy-driven stage. In the bubble-collapse stage, the impact generates a train of expansion-compression waves in the liquid that leads to the fragmentation of preexisting gas cavities. Upon bubble fragmentation, the sudden increase of the interface-area-to-volume ratio enhances mass transfer significantly, which makes the bubble volume grow by a large factor until CO2 is locally depleted. At that point buoyancy takes over, making the bubble clouds rise and eventually form buoyant vortex rings whose volume grows fast due to the feedback between the buoyancy-induced rising speed and the advection-enhanced CO2 transport from the bulk liquid to the bubble. The physics behind this explosive process sheds insight into the dynamics of geological phenomena such as limnic eruptions.